# UNITED STATES PATENT AND TRADEMARK OFFICE

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/609,246 | 06/26/2003 | Hong Wang | 42P16546 | 7754 |

8791    7590    07/27/2006

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

| EXAMINER |
|---|
| KENDALL, CHUCK O |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2192 | |

DATE MAILED: 07/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

| Office Action Summary | Application No.<br>10/609,246 | Applicant(s)<br>WANG ET AL. |
|---|---|---|
| | Examiner<br>Chuck O. Kendall | Art Unit<br>2192 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1) ☒ Responsive to communication(s) filed on *06/26/03, 11/10/03*.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

4) ☒ Claim(s) *1-25* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-25* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

## Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on *26 June 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some *   c)☐ None of:

    1.☐ Certified copies of the priority documents have been received.

    2.☐ Certified copies of the priority documents have been received in Application No. _____.

    3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
   Paper No(s)/Mail Date *10/30/03*

4) ☐ Interview Summary (PTO-413)
   Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____ .

### Detailed action

1.      This is in response to Application filed on 6/26/03 and 11/10/03.

2.      Claims 1 – 25 have been examined.

### Claim Rejections - 35 USC § 102

3.      The following is a quotation of the appropriate paragraphs of 35

U.S.C. 102 that form the basis for the rejections under this section made in this

Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4.      Claims 1, 4, 5, 18, 19, 22 and 23 are rejected under 35 U.S.C. 102(b) as

being anticipated by Peled et al. USPN 6,076,144.

Regarding claim 1, Peled anticipates a method, comprising:

analyzing a dynamic execution trace for a program (8:62 – 67, see

execution mode state machine, trace segment and looked up);

defining at least one stream comprising a sequence of basic blocks in the

dynamic execution trace, wherein only a last block in the sequence ends in a

branch instruction, the execution of which causes program flow to branch, the

remaining basic blocks in each stream each ending in a branch instruction, the

execution of which does not cause program flow to branch (4:5 – 17, see end

instruction in basic block A and conditional branch);

collecting metrics associated with the at least one stream (8:25 – 30, see

fill buffers and collect address and control information and decode uOPs, i.e.

linear micro-ops/instructions); and

optimizing the at least one stream based on the metrics (3:55 – 65, shows

spanning multiple lines of trace caching instructions or decoded micro-ops and

automatic unrolling i.e. optimizing).

Regarding claim 4, the method of claim 1, wherein the metrics are

selected from the group consisting of a number of instructions within the at least

one stream, a number of instructions of each type within the at least one stream,

values for particular operands, a coverage for each stream, and a frequency of

execution for the at least one stream (5:15 – 20, see predetermined number of

micro-ops of the macro-instruction, i.e. *number of instructions of each type within

the at least one stream*).

Regarding claim 5, the method of claim 4, further comprising in the case of

multiple streams being identified, further comprising identifying streams that are

spatially non-contiguous in the dynamic execution trace, but are temporally

contiguous (3:30 – 35, Examiner interprets the non-spatially non-contiguous and

temporally contiguous aspect as claimed by applicant to be equivalent to the data

array 200 in Peled).

Regarding claim 18 the computer readable version of claim 1, see rationale above as previously discussed.

Regarding claim 19 the computer readable version of claim 2, see rationale above as previously discussed.

Regarding claim 22 the system version of claim 1, see rationale above as previously discussed.

Regarding claim 23 the system version of claim 2, see rationale above as previously discussed.

### Claim Rejections - 35 USC § 103

5.      The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6.      Claims 2, 3 and 6 – 9 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Peled et al. USPN 6,076,144 as applied in claims 1 and 5, in

view of Mahalingaiah USPN 5,933,626.


        Regarding claim 2, Peled discloses all the claimed limitations as applied in

claim 1 above.  Although, Peled doesn't expressly disclose wherein the

optimizing comprises encoding the at least one stream as mesocode (interpreted

as microinstructions or microcode), he does disclose a decoder and microcode

sequencer, for processing micro-ops/instructions (3:10 – 14).  However,

Mahalingaiah in an analogous art and similar configuration discloses that early

decode units perform merging instructions into encoded prefix bytes

(Mahalingaiah,18:15 – 30).  Therefore it would have been obvious to one of

ordinary skill in the art at the time the invention was made to combine Peled and

Mahalingaiah because, since the earlier decode units have been known to

encode instructions it would make implementing that functionality into other

decoder units to encode data instructions as well.


        Regarding claim 3, the method of claim 2, wherein the mesocode

comprises microinstructions that are ISA-implementation specific (Peled, shows

the macro-instruction which are decoded into the micro-ops are application

specific 5:15 – 25).

Regarding claim 6, Peled discloses all the claimed limitations as applied in claim 5 above. Although, Peled doesn't expressly disclose wherein the optimizing comprises encoding the temporally contiguous streams so that they are spatially contiguous in the mesocode, he does disclose a data array which Examiner interprets to store the temporally contiguous streams that are spatially contiguous (3:30 – 35, see data array 200). However, Mahalingaiah in an analogous art and similar configuration discloses a microprocessor 10 configured to align instructions from instruction cache 16 to decode units 20, (4:50 – 55) and that early decode units perform merging instructions into encoded prefix bytes (Mahalingaiah, 18:15 – 30). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Peled and Mahalingaiah because, since the earlier decode units have been known to encode instructions it would make implementing that functionality into other decoder units to encode data instructions as well.

Regarding claim 7, the method of claim 2, wherein the optimizing comprises including a temporal hint within a basic block of the at least one stream which when executed causes a subsequent block to be prefetched for execution (Peled, 13:45 – 60, shows flagging (temporal hint) trace segments during an update of the control flow information and in 14:24 – 32, it shows a fetch request stage 810 of the build process of the control flow information).

Regarding claim 8, the method of claim 7, wherein the subsequent block is a block within the at least one stream (Peled,14:25 – 30, see basic block C).

Regarding claim 9, the method of claim 7, wherein in the case of multiple streams being identified, the subsequent block is a block from another stream (Peled, FIGURE 12, see Basic Block A, B and C and all associated text, shows having different instructions and address associated thereto).

7.      Claims 10 – 14 and 20 – 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peled et al. USPN 6,076,144 in view of Levy et al. USPN 5,627,994.

Regarding claim 10, Peled discloses a method, comprising:

partitioning a dynamic execution trace for a program into local traces (3:37 – 42, see trace segments);

analyzing each local trace for streams, each stream comprising a sequence of basic blocks that were sequentially executed, wherein only a last block in the sequence ends in a branch instruction, the execution of which causes program flow to branch, the remaining basic blocks in each stream each ending in a branch instruction, the execution of which does not cause program flow to branch (4:5 – 17, see end instruction in basic block A and conditional branch);

collecting metrics for each stream within a local trace (8:25 – 30, see fill

buffers and collect address and control information and decode uOPs, i.e. linear

micro-ops/instructions);

for each local trace assigning a locally unique identifier to each unique

stream within the local trace, and updating the collected metrics for each unique

stream (4:29 – 35, see micro-ops of each trace segment are accessed by

memory address/unique identifier).

Peled doesn't explicitly disclose merging stream information. However,

Levy in an analogous art and similar configuration discloses evaluating the

potential payoff resulting from combining two streams, which is done for all node

pairs to find the best two candidates for merging (19:10 – 15). Therefore it would

have been obvious to one of ordinary skill in the art at the time the invention was

made to combine Peled and Panwar, because it would enable estimating the

depth distribution resulting from superposition of any two streams (Levy,19:7 –

10).

Regarding claim 11, the method of claim 10, wherein the metrics are

selected from the group consisting of a number of instructions within each

stream, values for particular operands, a coverage for each stream, a number for

each type of instruction within the stream, and a frequency of execution for each

stream (Peled, 5:15 – 20, see predetermined number of micro-ops of the macro-

instruction, i.e. *number of instructions of each type within the at least one*

*stream).*

Regarding claim 12, the method of claim 11, further comprising ranking

the globally unique streams in accordance with a ranking criterion based on the

metrics (Peled, 4:45 – 50, see qualified with a criteria).

Regarding claim 13, the method of claim 12, further comprising selecting

the globally unique streams that have a ranking above a threshold (Peled, 5:25 –

35, see predetermined threshold).

Regarding claim 14, Peled discloses all the claimed limitations as applied

in claim 13. Peled doesn't explicitly disclose forming a control flow graph of

program execution wherein each selected globally unique stream defines a node

in the control flow graph and each edge between nodes is weighted in

accordance with a frequency that the edge was traversed. However, Levy in an

analogous art and similar configuration discloses constructing and AVL tree

including leaves (edges) keys (internal nodes) and a hash table in which the keys

are the page identifiers pointing to corresponding leaf elements (17:57 – 60).

Therefore it would have been obvious to one of ordinary skill in the art at the time

the invention was made to combine Peled and Levy because, it would enable

determining the time complexity of simulating the trace (Levy,18:1 – 5).

Regarding claim 20, the computer readable version of claim 10, see

rationale above as previously discussed.


Regarding claim 21, the computer readable version of claim 11, see

rationale above as previously discussed.


Regarding claim 24, the system version of claim 10, see rationale above

as previously discussed.


Regarding claim 25, the system version of claim 11, see rationale above

as previously discussed.


7.      Claims 15 – 17 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Peled et al. USPN 6,076,144 in view of Levy et al. USPN 5,627,994 as

applied in claim 14 and further in view of Lisitsa et al. USPN 6,594,773 B1.


Regarding claim 15, Peled as modified by Levy discloses all the claimed

limitations as applied in claim 14 above.  The combination of Peled and Levy

doesn't expressly disclose pruning edges of the control flow graph that fall below

a defined execution frequency.  However, Lisitsa in an analogous art and similar

configuration discloses a control manager, which examines all of the control

components in the graph and removes all unnecessary components from the

graph (19:21 – 27). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Peled and Levy with Lisitsa because, it would enable removing all unnecessary components in the graph.

Regarding claim 16, Peled as modified by Levy discloses all the claimed limitations as applied in claim 15 above. The combination of Peled and Levy doesn't expressly disclose traversing the pruned control flow graph to extract at least one chain of streams by following the most frequently executed edges from a root of the control flow graph. However, Lisitsa discloses in an analogous art and similar configuration filters drivers 120 and 122, which intercept data based on certain characteristics or events (6:54 – 60). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Peled and Levy with Lisitsa because, it would intercepting the streams based on specific information.

Regarding claim 17, the method of claim 16, further comprising optimizing each chain of streams (Levy, 11:50 – 60).

## Correspondence information

8.	Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chuck Kendall whose telephone number is 571-272-3698. The examiner can normally be reached on 10:00 am - 6:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Dam can be reached on 571-272-3695. The fax phone number for the organization where this application or proceeding is assigned is **571-273-8300**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ck.